



## **IRRIGATION MANAGEMENT NETWORK**

### **ECONOMICS OF FARMER PARTICIPATION IN IRRIGATION MANAGEMENT**

**R.K. Patil**

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*Dr Mary Tiffen,  
Editor, Irrigation Management Network  
ODI  
Regent's College  
Inner Circle  
Regent's Park  
London NW1 4NS.*

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## ECONOMICS OF FARMER PARTICIPATION IN IRRIGATION MANAGEMENT

R K Patil

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R K Patil is a Visiting Professor, National Institute of Bank Management  
and Consultant, Centre for Applied Systems Analysis in Development, Pune.

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# ECONOMICS OF FARMER PARTICIPATION IN IRRIGATION MANAGEMENT

R K Patil

## 1. INTRODUCTION

One of the implicit assumptions for the advocacy of irrigated agriculture is that the water availability is per se beneficial to the farmers, as it increases the productivity of the land and hence the farmers' incomes. So no farmer would abstain from the use of water, if this is available in adequate quantity. On this assumption, benefit-cost studies are done at the macro level to justify major and medium surface irrigation projects.

Of late, it is also suggested that if the management of water allocation and distribution were done by the farmers themselves at the tertiary and quaternary levels of the canal system, the benefits to the farmers would be more than they are at present. To-day, most of our public systems are managed by the bureaucracy right from headworks up to the farm gate. The bureaucracy establishes a clientele relationship with each and every farmer and is responsible for the operation and maintenance of the total system. The experience shows that bureaucratic management at the tertiary level is inefficient and prone to corrupt practices. Inadequate and untrained manpower, indifferent physical system, lack of knowledge of modern irrigation methods on the part of irrigators, are also responsible for the poor management. It is felt that if farmers' associations or societies are formed, these will bring in the needed efficiency. It is on this premise that the Sixth and the Seventh Plan documents endorsed the suggestion for the formation of water users' associations (WUAs). However, past experience shows that none of these assumptions has been validated in the field. Under-utilisation of water remains a fact of life and in spite of many incentives declared by the Union Government, and further aided by the World Bank, progress in forming WUAs has been extremely slow. It is, therefore, necessary to examine the assumptions in greater depth and find

out the reasons for the current state of affairs. Such an analysis may help in making the necessary policy changes.

At the outset, it may be stated that full utilisation of project water and related farmer behaviour are affected by a complexity of interactive factors: technical (the state of the physical system including drainage, reliability and stability of water), agronomic (soil conditions, suitability of crops) economic (price relations, marketing and credit facilities) and sociological. In this paper, we shall limit ourselves only to the financial and related aspects with a *ceteris paribus* assumption in respect of other factors.

We may start by raising two questions: why should a farmer take advantage of water available through public systems on conditions stipulated by the Agency and why should he collaborate with fellow farmers in forming a WUA for managing the distribution system in a small size command area, say of an outlet or a minor (40-300 ha)?

The rational answer to both the questions is almost simplistic. He would behave in the desired manner, if the costs he had to incur in both cases were lower than the benefits he was likely to get, and the surplus was sufficient to induce him to undertake the needed agricultural production and the processes thereto. We have to analyze the implications of this expected rational behaviour in respect of the issues raised.

## 2. ECONOMICS AND POLITICS OF IRRIGATED AGRICULTURE

Pursuing the above logic, one can say that a farmer in the command area would use irrigation water if the returns which he would get (i.e. physical production multiplied by the expected prices) exceeded the costs he had to incur (input costs including the water charges). If not, he may prefer rainfed agriculture or other ways of earning his living. This paper will not pursue the question of incomes from irrigated agriculture further, except to emphasise its importance in understanding the farmers' behaviour. We wish instead to focus on the incentives to form WUAs. First, let us review their objectives. It is said "active farmer involvement is cost effective in terms of the mobilisation of local resources, improvement and maintenance

activities, reduction of irrigation department staff time, provision of local wisdom for better design and planning of systems, reduction in the destruction of facilities, improved fee and fine collection, resolution of disputes and provision of an organised means of extension and farmer training." (Lowdermilk 1986).

The individual farmer may not be interested in saving the time of the departmental staff, cost recovery, etc. His simple question would be: How do I personally benefit from joining the society? If he or the society saves water, will any benefits accrue to him individually and, if so, in what form? Once the society is formed, there will be some collective costs, which he will have to share. Does he get tangible benefit from the costs so incurred? These questions need to be answered, before societies are formed by direction or by persuasion.

The process of establishing a WUA is complicated by many factors. Some mentioned by Carruthers et al (1985) are:

the roles and expected objectives of the associations are inconsistent with each other or unfocussed;

role expectations are unrealistic, given the resources and authority of the associations;

the responsibilities of the association are too trivial or undesirable to generate farmer commitment;

farmers and officials have inconsistent or conflicting definitions of their respective roles;

groups are too heterogeneous or too large to function;

farmers do not have enough technical knowledge to enable them to make reasonable decisions;

officials are unwilling to share information or authority;

farmer leadership is weak, inexperienced, or faction ridden.

As can be seen from the above list, there is a socio-political angle to WUA formation. Quite apart from weaknesses amongst the farmers, there is a question of power between officials and groups. The 'official' thinking is that groups will take away some of their management headaches, which is the main advantage of group management from their angle. However, groups are only willing to take responsibility provided it helps and benefits them as a group and as individual members. For this to happen, the Irrigation Agency must shed some of its powers and hand them over to groups. Unfortunately bureaucracy does not like surrendering powers, justifying this by a plea that it is the custodian of public interest. This plea has to be examined to see whether, in regard to each power involved, the public interest is really best served by the retention of control by the Irrigation staff, or whether there are other means of safeguarding public interest, and whether the staff are already so perfectly guarding the public interest that WUAs are likely to make the situation substantially worse, etc.

### 3. SUCCESSFUL AND UNSUCCESSFUL WUAs

Even if we assume the problems posed by the above factors are overcome, some financial and motivational problems would still remain.

#### a. Minors 5 and 7, Mula command

In Minor 5 of Mula Command, as a prelude to group formation, a rotational water supply (RWS) system was introduced and implemented. This meant costs to the responsible Agency. It was presumed that once the benefits were known, farmers would take over the system, and after RWS proved successful and beneficial, farmers would be asked to form a group. Their answer was: "What for?" They felt the RWS as operated by the Agency was quite satisfactory, and there was no need for them to take it over. It should be noted that Minor 5 is on an easily accessible route. VIPs are taken there to be shown the success of RWS and every care is taken to see the schedules are maintained and enforced. What this experience highlights is that unless something in the existing system causes dissatisfaction to the individual farmers, which could be corrected by forming an association, no WUA will be established. Farmers will not join groups unless the benefits

from membership outweigh the costs. In the above example, the costs of improving the water supply were born by the Agency, leaving farmers with no incentive to come together. By contrast, on Minor 7, which is more out of the way, farmers found that about six months after the introduction of RWS, the benefits of which they appreciated, the old problems began to occur again. Therefore, they have become interested in forming a Society and appointing their own waterman to supervise distribution. However, they are first asking for answers to cogent questions about society income, crop area rates, and whether they are free to change the cropping patterns. They have evident concern on financial matters before they proceed further.<sup>1</sup>

Let us, however, assume that by deliberate policy a situation is created which induces farmers to organise for collective action, and that they find it is in their interest to take over the management of a system or part of a system. The next question which requires examination, is the financial viability of the group and the policy changes necessary to ensure this viability. When a WUA is formed, some collective costs will be incurred to meet staff and administrative expenses.<sup>2</sup> These costs must be covered by some income source to ensure the long term sustainability of the group. The usual income of the WUA will be irrigation charges. In the case of a WUA managing a part of a system, such as a minor, the WUA has also to pay the Irrigation Agency managing the whole system water charges. It is therefore obvious that there must be some surplus between what members pay to the society and the irrigation dues that the society has to pay to the government. If the Agency charges the same rates to farmers that have

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<sup>1</sup> For further details, see RK Patil, "Experiences of farmer participation in irrigation management: Muia Command, Ahmednagar, Maharashtra", in *Irrigation Design for Management*, published by Hydraulics Research Ltd, Wallingford, UK, 1986. For these and other case studies see also Centre for Applied Systems Analysis in Development, 1987, "Farmer Managed Irrigation Systems: Indian experiences", No 2 Rehem Mansion, 44 S B Road, Colaba, Bombay 400039.

<sup>2</sup> Theoretically, farmers could avoid some cash costs by contributing physical and organisational work themselves on a voluntary basis. However, it will often be found that farmers prefer to specialise on their farming activities and to hire in operational staff, contract out for repairs, etc. In almost all cases, some cash costs for materials, fuel etc cannot be avoided. Therefore it is safest to make the assumption, as R K Patil does, that measures will be necessary to give financial viability to WUAs. (Ed., Mary Tiffen)



formed groups and to those that have not, there is no reason why the WUA should take management responsibilities which increase their costs. So there is a need for a policy to charge groups at lower rates than individual farmers. Unfortunately, in their enthusiasm for group formation, the State Irrigation Departments have neglected to analyse this problem and find a solution.

Informal discussion with irrigation officials of Maharashtra and Gujarat (where a few efforts at group formation are to be seen) suggests their thinking is that if societies are charged on a volumetric basis and the members on a crop area basis, there would be enough surplus to make the societies viable. This is not always the case, as two contrasting examples show.

**b. Experience of the Mohini Water Distribution Co-Operative Society, Gujarat**

One highly successful society is the Mohini Water Distribution Co-operative Society in Gujarat state. Briefly, the Society was established in 1979 with a membership of 142 farmers in a 428 ha command served by 3 subminors of the Kakrapara Irrigation system. Financially it became an instant success, distributing a dividend of 12% from the second year onwards. It is given the highest classification 'A' by the auditors of the Co-operative Department. It has a reserve fund of Rs 15,000, and Rs 150,000 earmarked in different funds. It owns a tractor, which is leased to members for cultivating operations. The Society is responsible for the payment of irrigation charges to the Department and these are fully paid every year. The staff are well paid, by local wage standards. In accordance with the agreement with the Irrigation Department of Gujarat State, the Society is charged on a volumetric basis and the Society charges its own members on a crop area basis. The volumetric rate was fixed at Rs 3 per 100m<sup>3</sup>. The current crop area rates are shown in Table 1. To understand the financial success of the Mohini Society it is necessary to analyse the volumetric rates per ha of crop (costs to the Society) and the scheduled crop area rates (gross income of the society) as is done in Table 1. It will be seen that surplus is available only from the sugarcane, orchard and cotton crops. Other crops have a deficit. At present prices, the society makes a profit only if the major area is put under sugarcane. If the major area was under

Table 1. Estimates of Water Charges on Volumetric Basis and Comparison with Irrigation Rates on Crop Area Basis (ha)  
Mohini Water Distribution Co-operative Society, Gujarat

Seasons	Crops	Water requirement as per modified Penman formula (in mm)	Total water requirement after adding losses @ 17.5% (in mm)	Water requirement in cubic metres per hectare	Value of water needed @ 30 paise per 10 cubic metres (in Rs)	Current Crop Area Rates per ha (in Rs)	Surplus or Deficit (in Rs)
Kharif	Sugarcane	215.8	261.5	2615	78.5	170.0	92.5
Rabi	Sugarcane	417.6	506.2	5062	152.0	280.0	138.0
Hot	Sugarcane	927.4	1124.1	11241	3370.0	370.0	33.0
Kharif	Paddy	557.3	675.5	6755	202.0	110.0	-82.0
Rabi	Vegetables	227.0	336.0	3360	101.0	100.0	-1.0
Hot	Vegetables	600.0	727.0	7270	218.0	140.0	-78.0
Kharif	Others	-	-	-	-	60.0	-
Rabi	Others	277.2	336.0	3360	101.0	100.0	-1.0
Hot	Others	601.2	729.3	7293	219.0	140.0	-79.0
Rabi	Wheat	450.0	545.0	5450	163.0	110.0	-53.0
Rabi	Sorghum	315.0	382.0	3820	115.0	100.0	-15.0
Pre-Kharif	Cotton	11.5	14.0	140	4.0	-	-4.0
Kharif	Cotton	333.0	403.0	4030	121.0	75.0	-46.0
Rabi	Cotton	153.0	185.0	1850	55.0	125.0	70.0
K + R + H	Orchards	770.0	933.3	9333	280.0	570.0	290.0

Table 2. Prescribed and Actual Cropping Patterns in Mohini Command

## a) Prescribed (from Modernisation Report, 1978)

		Percentage Area
<b>Kharif</b>		
(Paddy, Sorghum, Pulses, etc)		27
<b>Rabi</b>		
Sorghum	13	
Wheat	10	
Pulses and Vegetables	<u>15</u>	38
<b>Perennials</b>		
Sugarcane		18
Others		8
<b>Two-Seasonals</b>		
Cotton		2
Hot Weather Vegetables		<u>5</u>
		<u>98</u>

## b) Actual

Sugarcane	88.5
Paddy	5.0
Vegetables	0.5
Cotton, Fodder, and Wheat	0.5
Others	<u>5.5</u>
	<u>100.0</u>

food grains, the society would make losses. The Mohini Society became a financial success because more than 85% of the area was put under sugarcane, instead of the prescribed 18%.

In most Indian public irrigation systems, there is a prescribed cropping pattern based on the pattern estimated at the time the project was formulated. Though the design pattern should in theory be respected, the actual pattern varies considerably. If the Mohini Co-operative followed its prescribed cropping pattern, shown in Table 2 (a), it would be in deficit. Any group or society who abided by the prescribed pattern would not be viable, since the surplus is too small to cover its administrative and staff costs. The financial success of Mohini is primarily due to the sugarcane biased crop pattern, followed in practice (Table 2b).

c. The Siddheswar Water Distribution Society, Maharashtra.

An actual example proves the case. The data is from a Maharashtra Irrigation project where sugarcane is unimportant. The Siddheswar Water Distribution Society was registered early in 1986 to take over the management of Direct Minor 4 in the Bhima Project, Solapur District. The Society took over the management from the rabi season, 1986-87. Tables 3 and 4 present the financial data. Table 3 shows the finances of the society on a volumetric and crop area basis, based on the design crop pattern. The exercise is done for 200 ha assuming a cropping intensity of 1.48, as provided in the Appraisal Report. Under these conditions the Society will make a small surplus of Rs. 2404, which is inadequate to meet their collective costs. Table 4 shows what actually happened. The irrigated area totalled 192 ha, i.e. cropping intensity was less than planned and some suggested crops were not grown. Water charges totalled Rs 20,494, on the volumetric basis. However, the society's income, based on the crop area rates, was only Rs 18,195, resulting in a loss of Rs 2,300. They would also be unable to pay the cess to the local government, which is equivalent to 20% of the Government irrigation charge. This short exercise shows that if the society is to be sustained on a long term basis, some more avenues of income have to be sought. Alternatively, it will be necessary to revise charges upwards, or to change crops. It should not be assumed any of these options will be attractive to the Society, particularly without careful investigation of the income that can be derived from irrigated crops compared with unirrigated crops, taking into account the suggested level of water charges. It will be noted that farmers did not grow the suggested groundnuts, cotton, and chillies. If the economics of a WUA are going to depend on the adoption of new crops, it will be necessary to ensure that market conditions are attractive, and that the necessary inputs and knowledge are available as part of the preparatory work for a WUA.

d. Conclusion

In our enthusiasm to set up WUAs we must not forget the financial viability of the society and also of individual irrigators. Otherwise, all efforts at setting up WUAs will come to nought. A careful analysis of the financial situation of the society as it relates to the crop pattern and the rate structure has to be done before they are set up. A policy decision

Table 3. Budget Exercise of Siddeshwar Water Distribution Society (Net Service Area 200 ha) Based on Design Cropping Pattern

Crop	Design Crop Pattern	Area Under Crops (ha)	Crop Area Rate (Rs/ha)	Income of the Society (Rs)	Water Require- ment (000m <sup>3</sup> /ha)	Water Charges on Volu- metric basis (3x6xRs 23.55)	Surplus/ Deficit (Rs)
1	2	3	4	5 (Col 4x3)	6	7	8
<b>Perennials</b>							
Sugarcane	6.3	12.6	750	9450	28.48	8450	1000
Fruit	0.7	1.4	500	700	28.48	939	-239
<b>Kharif</b>							
Sorghum/Millet	32.0	64.0	50	3200	3.5	5275	-2075
Maize	7.0	14.0	50	700	3.5	1154	-454
Vegetables	2.0	4.0	100	400	3.5	330	70
Pulses							
(Unirrigated)	10.0	20.0	-	-	-	-	-
<b>Rabi</b>							
Wheat/Maize	15.0	30.0	75	2250	9.0	6358	-4108
Local/Sorghum	40.0	80.0	75	6000	4.0	7536	-1356
Gram	7.0	14.0	75	1050	4.0	1319	-269
Vegetables	2.0	4.0	167	668	5.0	471	197
Chillies	2.0	4.0	333	1332	6.5	612	720
H W Groundnut	15.0	30.0	300	9000	6.5	4592	4408
L S Cotton	9.5	19.0	400	7600	6.5	2908	4692
Total	148.5	297.0	-	42350	-	39944	2406
Net Area	100.0	200					

Table 4. Estimates of Siddeshwar's Financial Situation in the Rabi Season 1986-87.

Crop	ha	crop rate Rs/ha	income of Society	Water delivered (day-cusecs)	Government charges at volumetric rate (Rs)
1	2	3	4	5	6
Sugarcane	16.50	300	4950.0		
Sorghum	149.50	75	11212.5		
Wheat	16.15	75	1211.5		
Gram	5.65	75	424.0	355.68	667 per million
Vegetables	0.40	167	67.0	day-cusecs (870 207m <sup>3</sup> )	(Rs 23.55 for 1000m <sup>3</sup> )
Maize	1.10	75	82.5		
Others	3.30	75	247.5		
Total	192.60	-	18195.0	355.68	20 493

Deficit = Rs 2289

might be made to charge higher rates to farmers who are not members of a WUA. There has to be some financial incentive to the members of WUAs. Or, if they have to pay more than other farmers, they should be convinced that there will be tangible benefits from a better water service.<sup>3</sup>

#### 4. COSTS AND METHODS OF ORGANISING GROUPS

Finally we would like to refer to the costs that need to be incurred by voluntary agencies and government agencies when initiating the group formation process. So far we have discussed the economics of individual farmers and society. But some costs have to be incurred when persuading the irrigators of the advantages of farmer participation and preparing them for the organisational effort. Unfortunately, no data are available in this regard. The efforts in Mohini were made by leaders from amongst the irrigators. Many Gujarati farmers are already members of co-operatives running sugar factories, and are therefore familiar with the organisational requirements. In Maharashtra, so far, CADAs have done the preliminary work. But no information is available on the costs incurred. The only firm information relates to the Sri Lanka experiment of Institutional Organisers supported by USAID and assisted by Cornell University.

In a pilot area of over 4000 ha in the Gal Oya project command, the Institutional Organisers' experiment was started in 1981. The cost of the programme, including all training, supervision and salaries was about Rs 150 per ha per season. Direct benefits from increased production came to about Rs 225 per ha per season. The cost of the maintenance phase is estimated at Rs 30 per ha per season. The capital output ratio works out at 1:1.5. These calculations do not include intangible benefits like reduced damage to the physical structure, reduced conflicts over water and yield increases attributable to more reliable water which encourage adoption of new

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<sup>3</sup> This analysis also shows the importance to farmers of being able to manage the accounts of their society. Readers might like to refer back to ODI Irrigation Management Paper 9c, 1984, where G. Belloncle describes a method by which previously illiterate farmers were taught both literacy and accountancy, based on the management requirements of their systems. Ed. Mary Tiffen

technology. Uphoff (1986) concludes by saying that such a rate of return on 'software' is several times greater than that accepted now on investments in irrigation hardware.<sup>4</sup>

As noted above, we have no data on the likely costs that are needed for organising farmer groups in the Indian situation. However, in September 1985, the Ministry of Water Resources prepared a scheme for farmer participation to be implemented by voluntary organisations. They estimated an annual expenditure of Rs 230 000 for an area of about 1000 ha. It was expected that the organisational work would taper off and in about 3 to 5 years, societies would be able to function on their own, without any outside assistance. This would mean a capital expenditure of roughly Rs 600 000 for 1000 ha in 3 years. Thus, the annual cost would come to about Rs 200 per ha per year. It is difficult to estimate the pay off from this expenditure in monetary terms. But assuming the project became a success, it would lead to water saving, timely deliveries and a consequently favourable effect on yields and hence on the recovery of irrigation charges. There is a presumption that this sort of outlay should give a capital-output ratio of more than 1:1.5 over three to four years. It is time that we tested this hypothesis on a pilot basis. In any case, the present situation is extremely unsatisfactory and efforts have to be directed towards rectifying the obvious weaknesses.

It is our submission that the pilot programme tested in Sri Lanka needs to be introduced into our projects with suitable modifications to accelerate water utilisation. Though precise calculations of costs and benefits are not possible at this juncture, there is a hope, based on isolated success stories, that the experiment would result in a greater payoff. In our situation, there is a need for planned outside intervention into the irrigators' community, which is demarcated by hydraulic considerations, just strong enough to

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<sup>4</sup> A fuller account of the Sri Lankan programme is given in International Irrigation Management Institute (IIMI) 1986 "Proceedings of the workshop on participatory management in Sri Lanka's irrigation schemes". In this, Perera gives slightly higher costs for the Institutional Organiser (IO) programme. He also comments on the repeated need for training, due to high turnover by IOs who preferred more permanent employment. There is a conflict between the aim of providing only temporary help to farmers in the initial stages of forming a WUA, and the IO's desire for a permanent career. (Ed. Mary Tiffen)



catalyse the internal dynamism of the community, but sagacious enough not to dominate it. The type of talents needed for this effort are amply available in rural areas. What is needed, is strong financial support for non-governmental organisations. It must be emphasised that any government intervention is likely to be counter-productive and any pilot experiments have to be conducted by the non-governmental organisations. The experience of the Mula project, though limited, brings out clearly the weaknesses of government supported intervention.<sup>5</sup>

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<sup>5</sup> Readers may like to debate whether, and under what circumstances, non-governmental organisation (NGO) can be effective in instigating WUAs. Are they more suited to test out a model in a few areas rather than introducing them on a large scale? Is there a danger they would be too paternalistic? Would they want to impose social objectives that might not be shared by the farmers? (Ed., Mary Tiffen)